INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 5, Issue 3)
Available online at: www.ijariit.com

Behaviour and effect of coconut choir in concrete

Ankush Kumar Shukla
ankushshukla854@gmail.com
Bapu Rao Deshmukh College of Engineering, Wardha, Maharashtra

Dr. S. G. Makarande
sangam209@gmail.com
Bapu Rao Deshmukh College of Engineering, Wardha, Maharashtra

Vaibhav Kalmegh
vaibhavkalmegh@gmail.com
Bapu Rao Deshmukh College of Engineering, Wardha, Maharashtra

ABSTRACT

Fibers are very important material for mankind. The fibers which we are using are of coconut and it is very easily available. The fibers are reduced to the required length of 10mm in this process. The content is to be mixed at 2%, 3%, 5% and there will be a certain test to be performed in order to observe the effect of coconut choir in concrete. The enhancablity of the properties will be determined and it is checked whether the concrete structure will be suitable for light work or heavy works. The works to be done are under the supervision and under the guideline of Indian standard.

Keywords— *Coconut fiber, Concrete, Natural fibre, Compressive strength, Workability test such slump cone test, Compaction*

1. INTRODUCTION

Coconut fiber is naturally occurring fibers. They are present in the outer layer of coconut and are very easily available in the market as well as in the coastal areas. Coconut fibers are brown in color and are organic in nature. The fibers have the potential to be used as low cost binding material in construction units. They can be proved a good insulating material. The concrete has some common materials which are used to prepare it like cement, aggregates (coarse and fine), water etc. concrete has a very good compressive property but the tensile property is not up to the mark unless and until we provide reinforcement.

There are a lot of fibers present in the market both synthetic as well as natural but the factor which makes natural fibers to stand in one step ahead is its availability, cheapness, being eco-friendly etc.

1.1 Objective

The objective of the experiments is to find out the behavior of coconut choir in the concrete whether it increases or we can say improve the quality of concrete physical properties. The investigations will involve:

(a) Compression test.
(b) Split tensile strength.
(c) Slump test.

2. LITERATURE REVIEW

Slate FO et al (1976) [1]: He investigated various properties of the concrete by mixing coconut choir at various ratios of 1:2.75 and keeping water content of 0.5. The fibre content was also kept at a low percentage by weight of the ingredients of the concrete. He did curing of the specimens for 8 days and found out that the strength is increased.

Nandish S C et al[2] (2015 June): His study describes the various test done in order to check the strength enhancement of the concrete application of fiber reinforcements. Test like slump test was carried out as well as compressive strength test and split tensile test was also carried out. A gradual increase in the strength was noticed when the specimen was kept for 7, 14 and 28 days.

Roohollah et al[3] (2012): There were investigated that the workability and tensile strength of concrete increased to some extent as the coir Increased. Concrete cubes produced by 1%, 2%, 3%, 4%&5% addition attained 28 days tensile strength of 2.68, 2.90, 3.11, 3.25, 2.33 respectively.

Ramakrishna et al (2005): Investigated the variation in chemical composition and tensile strength for four natural fibres, that is. coconut, sisal, jute and hibiscus cannabinus fibres, when subjected to alternate wetting and drying, continuous immersion for 60days in water, saturated lime and sodium hydroxide. The chemical composition of fibres changed because of immersion in the considered

solutions. Continuous immersion was found to be critical due to the loss of their tensile strength. However, coconut fibreswere reported best for retaining a good percentage of its original tensile strength in all tested conditions.

Majid Ali et al (2011): He investigated and studied the versatility and application of coconut fibre in different fields. He concluded that Coconut fibre is reported as more ductile and energy absorbent material. It is concluded that coconut fibre has the potential to be used in the composite for a different purpose.

3. MATERIALS AND METHODOLOGY

Following materials are required for various tests to be performed:

(a) The cement of OPC grade 43
(b) Aggregates (both fine and coarse)
(c) Water
(d) Coconut choir

3.1 Cement

Cement is the most important material for making of concrete. There are a lot of cement are available in the market of various grades and specifications.

3.2 Aggregates

Aggregates are used as per IS CODE. Coarse aggregates of size 20 mm and 10 mm minimal size having detailed gravity 2.66 authorizing to IS 383:1970 was used in this study. Crushed sand of zone-II having specific gravity 2.64 approving to IS 383:1970 was used in this Examination.

3.3 Water

Water should be taken according to the specific requirement for the test of the concrete.

4. METHODOLOGY

A concrete mixture was designed to achieve the minimum grade as required by Indian Standard Code Book 456 –2000. The examination prepared by the different percentage of coconut fiber in the concrete combination strategy.

By referring to various journals we came to the conclusion that when we increase the fiber content, the mix became more cohesive & the ease of working is decreased. Therefore we add some admixtures in order to improve the workability of concrete.

In order to achieve the required workability, we add some admixtures which do not alter the rate of working a hence providing good strength and ease.

We prepared three specimens for the analysis of different tests. Following tests were performed by us:-

(a) Compressive test.
(b) Split tensile test.

Concrete mixes of grade M30 was made using OPC. Replacement of cement was made using Supplementary Coconut Fibers, with defined percentage 2%, 3%, and 5% respectively.

5. TEST ON MATERIALS

5.1 Test on cement

Table 1. Properties of cement obtained

Test Performed	Values Obtained
Finess modulus	90%
Specific gravity	3.0
Initial setting time	30 MINS
Final setting time	600 MINS

5.2 Test on coarse aggregate

Table 2: Properties of coarse aggregate obtained

Test Performed	Values obtained
Specific gravity	2.5
Water absorption %	2.65%
Bulk density	1700

5.3 Test on fine aggregate

Table 3: Properties of fine aggregate obtained

Test Performed	Values Obtained
Specific gravity	2.55
Bulk density	1500

5.4 Fiber preparation

The fiber is collected from the local market from coconut vendors as well as it is cut in a specified length of 10mm (1 cm) length. It is kept in water for about 45 min so that the knots can easily and homogenously open up and there is an ease of work with those fibres.

6. RESULTS

6.1 Compressive test analysis

The compressive test was performed by preparing 3 cubes of control mix or control cubes which were cured for 7, 14, and 28 days, as well as 3 cubes with 2%, 3% and 5% of coconut fibers each, were prepared.

The cube size was 150x150x150mm and all the norms of IS CODE BOOK were followed.

Table 4: Values of compressive test obtained for control cubes

Days	Values(N/MM^2)
7	22.1
14	24.7
28	30.3

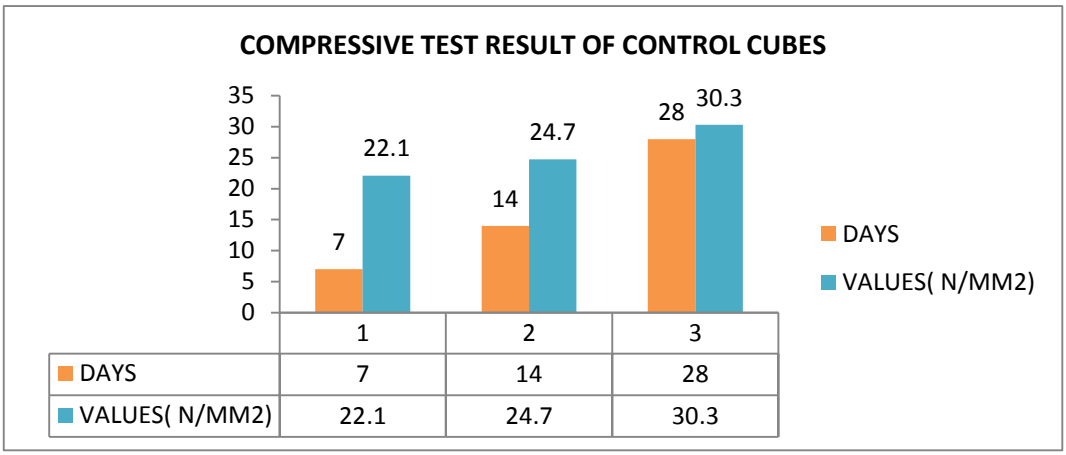

Fig. 1: Bar graph of the compressive result of control cubes

Below are the chart and tables of the values obtained of the cubes when concrete is mixed with different percentages of coconut fibers.

Table 5: Values of compressive test result of coconut choir concrete

Days	2%	3%	5%
7	23.4	21.6	18.2
14	27.1	29.3	25.8
28	32.5	33.6	29.4

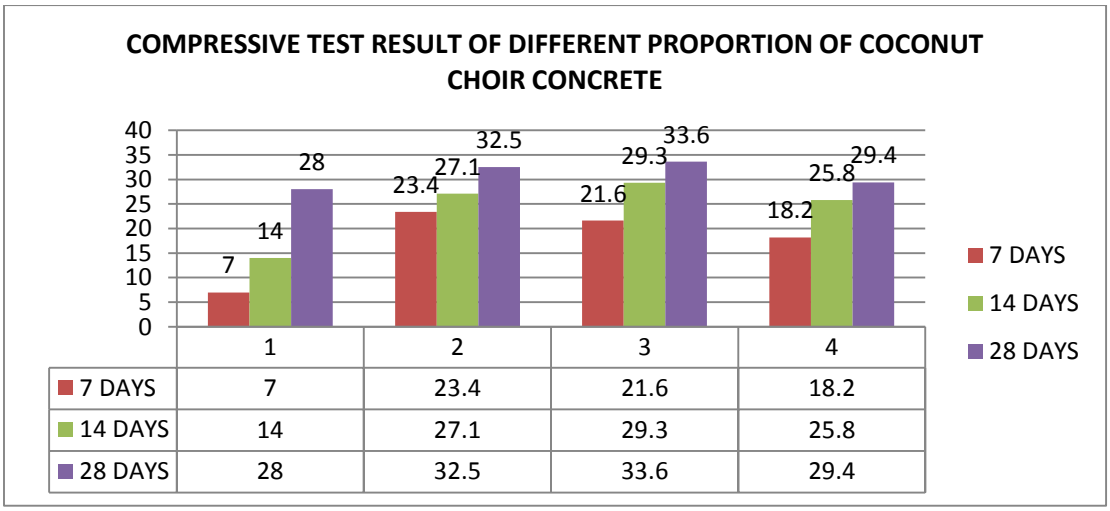

Fig. 2: Bar graph showing result values of a compressive test of coconut choir concrete.

6.2 Split tensile test analysis

The split tensile test is a very important aspect of checking the tensile strength of concrete. Since concrete has less tensile strength we provide reinforcement hence here we have provided coconut choir and below are the result analysis of the test.

For the split tensile test we have prepared cylindrical specimen of diameter 150mm and length 300mm for each proportion.

Table 6: Values obtained after 7 14 and 28 days of the control specimen

Days	Values Obtained
7	0.54
14	1.23
28	1.75

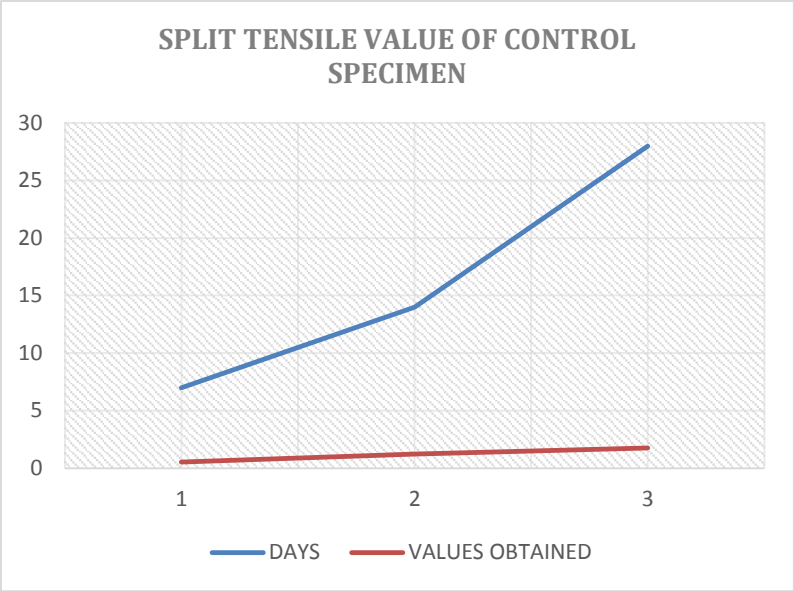

Fig. 3: Line graph showing values of the control specimen

On mixing various ratios of concrete that is 2%, 3%, 5% we obtained the following values:

Days	Values obtained of different proportion		
7	1.2	1.55	1.87
14	1.6	1.94	2.45
28	2.34	2.58	2.97

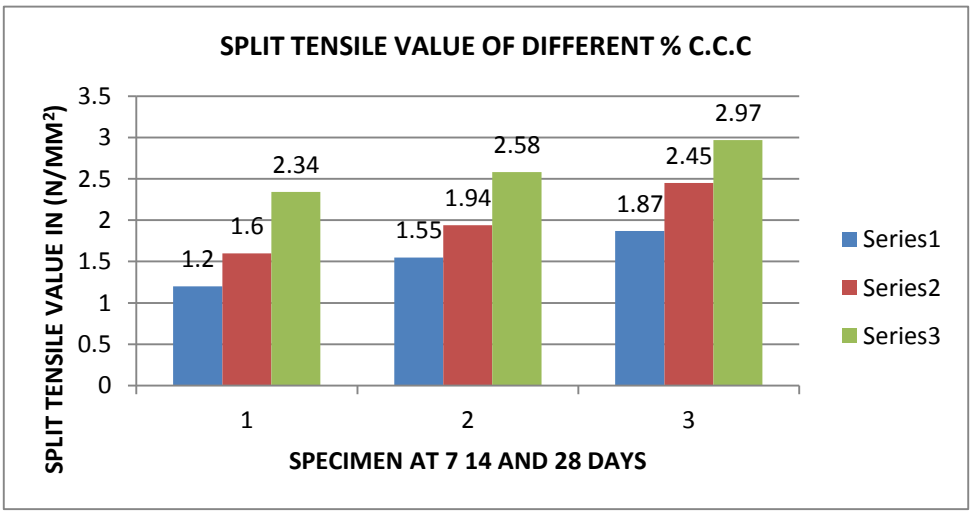

Fig. 4: Split tensile value bar chart of different proportion of coconut fibers

7. CONCLUSION

The properties of coconut choir concrete are obtained and determined under the supervision and following the standard norms of all civil engineering application. The tests done were a compressive test and split tensile test which had been performed taking great care and following all the prescribed rules and regulation.

We can see that when the amount of coconut choir is low at 2% and 3% the strength is acceptable but when we increase the content to 5% the strength decreases gradually. With respect to compressive strength, incorporating a small amount of CF 2% enhances the performance of concrete, as expected and counters harmful shrinkage effects in concrete. The results suggest that short coconut fibers are more effective in enhancing the performance of concrete.

The recommended threshold value of the fiber content that will benefit the long term durability of the concrete in all environments is 2.0 % or 3%. The properties can increase or decrease depending upon fiber length and its content. As a result of this CFRC strengths can be greater than that of plain concrete.

8. REFERENCES

[1] Slate FO, "Coconut fibers in concrete", Eng J Singapore Vol. 3(1), pp. 51–54, (1976).
[2] Cook DJ, Pama RP, Weerasingle HLSD "Coir fibre reinforced cement as alow-cost roofing material", Build Environ, Vol. 13(3), pp.193–198, (1978).
[3] Aziz MA, Paramasivam P, Lee SL "Prospects for natural fibre reinforced concretes in construction", Int J Cem Compos Lightweight Concrete, Vol. 3(2), pp.123–132, (1981).
[4] Paramasivam P, Nathan GK, Das Gupta NC "Coconut fibre reinforced corrugated slabs" Int J Cem Compos Lightweight Concrete, Vol. 6(1), pp.19–27, (1984).
[5] Agopyan V, Savastano Jr H, John VM, Cincotto MA. Developments on vegetable fibrecement based materials in São Paulo, Brazil: an overview. Cem Concr Compos 2005; 27(5):527–36.
[6] John VM, Cincotto MA, Sjostrom C, Agopyan V, Oliveira CTA. The durability of slag mortar reinforced with coconut fibre. Cem Concr Compos 2005; 27(5):565–74.
[7] Mohammad HBMH "Coconut fiber reinforced wall panelling system", Master's thesis, Faculty of Civil Engineering, Universiti Teknologi, Malaysia, (2005).
[8] Ramakrishna G, Sundararajan T. "Studies on the durability of natural fibres and the effect of corroded fibres on the strength of mortar", Cem Concr Compos Vol.27 (5), pp.575–582, (2005).
[9] Li Z, Wang L, Wang X. "Flexural characteristics of coir fiber reinforced cementitious composites", Fiber Polym, Vol. 7(3), pp.286–294, (2006).
[10] Reis JML "Fracture and flexural characterization of natural fiber-reinforced polymer concrete", Construction and Building Materials, Vol. 20(9), pp.673–678, (2006).
[11] Asasutjarit C, Hirunlabh J, Khedari J, Charoenvai S, Zeghmati B, Shin UC "Development of coconut coir-based lightweight cement board", Construction and Building Materials, Vol. 21(2), pp.277–288, (2007).
[12] Majid Ali "Coconut fibre: A versatile material and its applications in engineering", Journal of Civil Engineering and Construction Technology, Vol. 2(9), pp. 189-197, (2011).

